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Attorney's Docket No. 5776-131

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In re:	Maeda et al.	Confirmation No.:	9818
Appl. No.:	09/631,491	Group Art Unit:	1742
Filed:	August 3, 2000	Examiner:	H. Wilkins, III
For:	HYDROGEN ABSORBING ALLOY AND NICKEL-METAL HYDRIDE RECHARGEABLE BATTERY		

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APPEAL BRIEF TRANSMITTAL
(PATENT APPLICATION – 37 C.F.R. § 1.192)

1. Transmitted herewith, in **triplicate**, is the APPEAL BRIEF in this application, with respect to the Notice of Appeal filed on August 22, 2003.

2. ☐ Applicant claims small entity status.

3. Pursuant to 37 C.F.R. § 1.17(c), the fee for filing the Appeal Brief is:
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APPEAL BRIEF UNDER 37 CFR § 1.192

This Appeal Brief is filed pursuant to the "Notice of Appeal to the Board of Patent Appeals and Interferences" filed August 22, 2003.

1. ***Real Party in Interest.***

The real party in interest in this appeal is Shin-Etsu Chemical Co. Ltd., the assignee of the above-referenced patent application.

2. ***Related Appeals and Interferences.***

There are no related appeals and/or interferences involving this application or its subject matter.

3. ***Status of Claims.***

The present appeal involves Claims 1, 5-7, 12, 16 and 17, which are currently under final rejection as set forth in the Official Action dated May 23, 2003. Claims 2-4 and 8-11 have been cancelled. Claims 13-15 have been withdrawn as directed to a non-elected invention. The claims at issue, namely, Claims 1, 5-7, 12, 16 and 17, are set forth in the attached appendix.

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4. ***Status of Amendments.***

An Official Action was mailed May 23, 2003, finally rejecting pending Claims 1, 5-7, 12, 16 and 17 under 35 USC § 103(a). Applicants did not submit any claim amendments after this final Official Action.

5. ***Summary of the Invention.***

Metal alloys have been used as hydrogen absorbing alloys for forming electrodes in nickel-metal hydride rechargeable batteries. Introducing relatively high levels of cobalt to an alloy can reduce the susceptibility thereof to particle size reduction in a hydrogen-loaded state. While this can prolong the life of the battery, the battery may not exhibit desired discharge rates. Page 1, lines 17-23 of present application.

Alternatively, reducing the cobalt content in an alloy may improve discharge properties. It is believed that the reduced cobalt content can promote particle size reduction, and thereby increase surface area per unit weight of the material. However, reducing the amount of cobalt in the alloy can adversely affect the life of the battery. Page 1, line 24 to page 2, line 4 of present application.

The present invention is directed to a hydrogen absorbing alloy having a $CaCu_5$ crystal structure in its principle phase. The alloy includes 24 to 33 % by weight La; 0.1 to 1.0 % by weight Mg; and greater than 0 % and less than or equal to 6 % by weight Co. Claims 1, 5, 12, and 16. The hydrogen absorbing alloy can be used to form electrodes for use in nickel-metal hydride rechargeable, or secondary, batteries. The inventors have found that such a hydrogen absorbing alloy can exhibit desirable high discharge properties. Yet despite the relatively low cobalt content, below that of conventional alloys, the alloys can also suppress particle size reduction and thus prolong the life of the battery. Page 2, lines 6-21 of present application.

The alloys of the invention also differ from conventional alloys with respect to the lattice constants in the crystalline structure. The hydrogen absorbing alloy can also be defined as having an a-axis length of 4.990 to 5.050 Å and a c-axis length of 4.030 to 4.070 Å for the lattice constants in the crystalline structure. Claims 6, 7, and 17. The inventors have found that the addition of magnesium tends to increase the lattice constants, and in particular, increase the c-

axis constant more than the a-axis constant. This can result in an alloy less likely to exhibit particle size reduction, which in turn can increase cycle life of a battery. Page 7, lines 7-18 of present application.

6. ***Issues.***

The issues in the present appeal are as follows:

Whether Claims 1, 5-7, 12, 16 and 17 are properly rejected under 35 USC § 103(a) as being unpatentable over Yanagihara et al. (JP 60-250557), and specifically:

(1) Whether it is proper to modify the teachings of Yanagihara et al. when there is no basis or motivation to make the proposed modification; and

(2) Whether it is permissible for the Examiner to reject claims under Section 103(a) as being obvious when the evidence presented by Applicants demonstrate that the claimed invention provides an unexpected result not contemplated or suggested by Yanagihara et al.

7. ***Grouping of Claims.***

Claims 1, 5, 12, and 16 may be analyzed together.

Claims 6, 7 and 17 stand separately because these claims define subject matter which render them patentable independently of the other claims.

8. ***Argument.***

(1) There Is No Basis in the Art for Modifying Yanagihara et al.

Claims 1, 5-7, 12, 16 and 17 stand rejected under 35 USC § 103(a) as being unpatentable over Yanagihara et al. (JP 60-250557). Yanagihara et al. is directed to alloys of the general formula $LaNi_xCo_yM_z$. The components of the formula are defined broadly as follows: M is at least one element selected from the group consisting of Al, Sn, Mg, Fe, Mo, Ta, V, Cr, Cu, Mn, and Nb; $1.5 < x < 4.0$; $0 \leq z \leq 1$; $3 < x+y < 5.5$; and $4 < x+y+z < 5.5$. Preferred examples of alloys are stated to include $LaNi_3Co_{1.7}Al_{0.3}$, $LaNi_{2.7}Co_{2.0}Al_{0.3}$ and $LaNi_3Co_2$. See page 1, lines 19-20; page 8, line 25 to page 9, line 1; and Table 1 of the translation of Yanagihara et al.

provided by Applicants during prosecution with the Amendment After Final filed September 30, 2002.

The Examiner acknowledges that Yanagihara et al. is deficient because it fails to teach alloys with the claimed range of La. Applicants submit that Yanagihara et al. also fail to suggest the claimed alloys.

The Examiner argues that that claimed invention is obvious in view of Yanagihara et al. To reach this conclusion, the Examiner must select specific values for the subscripts from among the ranges given. The Examiner must also select Mg from among the laundry list of possible choices for M. The Examiner must pick and choose from among the numerous possible combinations of variables, despite the absence of any motivation or suggestion to pick and choose these specific values from the broad teaching of Yanagihara et al.

Even after picking and choosing among the possible combinations of options available within the broad teaching of Yanagihara et al., the resultant alloy composition still is not the same as that claimed. Despite this, the Examiner argues that the resultant composition is "close enough" to render the claimed alloy obvious, citing MPEP 2144.05.

To aid in a better understanding of Yanagihara et al., Applicants submitted a full English translation thereof during prosecution. The translation further demonstrates that Yanagihara et al. do not teach the alloys of the claimed invention. Further, Yanagihara et al. do not motivate one of skill in the art to expand beyond the teachings therein to accomplish the achievements of the claimed invention.

Yanagihara et al. lists 14 alloy compositions. La, Mg and Co contents were calculated for each composition as shown in Table 1 below.

Table 1. Alloy of Yanagihara et al.

No.	Alloy	Content (wt%)		
		La	Mg	Co
1	$LaNi_5$	32.1	0.0	0.0
2	$La_{0.9}Ca_{0.1}Ni_{4.5}Co_{0.5}$	29.6	0.0	7.0
3	$LaNi_{2.7}Co_2Al_{0.3}$	32.8	0.0	27.8
4	$LaNi_3Co_{1.7}Al_{0.3}$	32.8	0.0	23.7
5	$LaNi_{3.5}CoAl_{0.5}$	33.3	0.0	14.1
6	$LaNi_3Co_2$	32.1	0.0	27.2
7	$LaNi_3Co_{1.7}Sn_{0.3}$	30.8	0.0	22.2
8	$LaNi_3Co_{1.7}Mg_{0.3}$	32.9	1.7	23.7
9	$LaNi_3Co_{1.7}Fe_{0.3}$	32.2	0.0	23.2
10	$LaNi_3Co_{1.7}Fe_{0.3}Mo_{0.1}$	31.5	0.0	22.7
11	$LaNi_3Co_{1.7}Ta_{0.3}V_{0.1}$	29.3	0.0	21.1
12	$LaNi_3Co_2Cr_{0.3}$	31.0	0.0	26.3
13	$LaNi_3Co_2Mn_{0.1}$	31.7	0.0	26.9
14	$LaNi_3Co_2Al_{1.2}$	34.2	0.0	29.0

* Atomic weight for each elemet is as follows:
La: 138.9, Ca: 40.1, Mg: 24.3, Ta: 180.9, Mn: 54.9
Ni: 58.7, Al: 27.0, Fe: 55.8, V: 50.9,
Co: 58.9, Sn: 118.7, Mo: 95.9, Cr: 52.0,

As is evident from the table, none of the Yanagihara et al. examples contain cobalt in an amount greater than 0% by weight and less than or equal to 6% by weight, as required by the claimed invention. Further, as noted above, the Examiner admits that Yanagihara et al. fail to meet the claimed range of La, even when the cobalt content is assumed to be 6.0 weight percent. Thus, Yanagihara et al. do not disclose alloys having overlapping concentration ranges, either in the general description or in the examples.

Indeed, when considered in its entirety for all that it fairly teaches, Yanagihara et al. actually teach away from alloys which include both magnesium and cobalt in the claimed amount. As demonstrated by Table 1, all of the examples of alloys that include cobalt as a component include cobalt in an amount greater than that claimed. In addition, the examples of

alloys that include both cobalt and magnesium include cobalt in an amount significantly greater than claimed. See Example 8, which includes 23.7 weight percent cobalt and Example 9, which includes 23.2 weight percent cobalt. Thus, if anything, Yanagihara et al. suggest that for alloys that include La, Mg, and Co, Co is present in significantly greater amounts than the alloys of the claimed invention.

The overall discussions of Yanagihara et al. further demonstrate the absence of any suggestion to modify the alloy composition proposed by the Examiner. Yanagihara et al. purport to provide a sealed alkaline battery having a lowered increase of the internal battery pressure by overcharging. Page 3, lines 14-16. In describing alloys which lower the increase in battery pressure, Yanagihara et al. provide no teaching or suggestion to provide an alloy having the claimed ranges of elements, much less to provide an alloy including cobalt in an amount greater than 0 % by weight or less than or equal to 6 % by weight.

The purpose of the present invention, which is unrelated to the purpose and teaching of Yanagihara et al., is to combine the favorable particle size properties of alloys having high cobalt content with the favorable discharge properties of alloys having low cobalt content. As stated in the specification, alloys with higher cobalt contents are less liable to particle size reduction in their hydrogen-loaded state. Thus they can effectively prolong the lives of nickel-metal hydride rechargeable batteries when they are used for the negative electrodes thereof. Page 1, lines 17-23 of present application. Alloys with lower cobalt contents, however, are more desirable for improving high rate discharge properties. Page 1, line 23 to page 2, line 1 of present application.

To solve the problems of the prior art, the present invention provides a hydrogen absorbing alloy which can provide a high rate discharge property while suppressing particle size reduction and which can exhibit cycle life characteristics equal to or higher than those of conventional alloys. This improvement can be exhibited even when the cobalt content of the alloy is decreased. The batteries can also exhibit high capacity. Page 2, lines 6-12 of the application. These goals are achieved by the invention through use of a unique alloy composition.

Yanagihara et al. accordingly address a different problem than that solved by the present invention. Yanagihara et al. do not recognize issues associated with alloys with relatively high

and relatively low cobalt concentrations, much less suggest a solution to such a problem. Yanagihara et al. certainly do not motivate one skilled in the art to select alloy components and amounts to provide the benefits of alloys with both high and low concentrations of cobalt. To conclude otherwise requires an improper hindsight analysis based upon Applicants' own teachings.

Obviousness cannot be established by combining or modifying the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the modification or combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F2d 1572, 1577, 221 USPQ 929, 933 (Fed.Cir. 1984). A Section 103 rejection presumes the existence of differences between the subject matter claimed and the teachings of the prior art. Thus, the Examiner must be able to point to something in the prior art that suggests in some way a modification of a particular reference or a combination with another reference to arrive at the claimed invention. Absent such a showing in the prior art, the Examiner has impermissibly used the Applicants' teaching to hunt through the prior art for the claimed elements and combine them as claimed. *In re Laskowski*, 871 F2d 115, 117, 19 USPQ 2d 1397, 1398 (Fed.Cir. 1989).

This is what the Examiner has done in the present case. The Examiner must pick and choose from among a laundry list of elements to select Mg as an alloy component and to select the specified subscripts in an effort to define an alloy as claimed. Yet even after such selection, the resultant alloy is not the same as claimed.

There is no basis in the prior art to suggest to one of ordinary skill in the art to modify this specific example selected by the Examiner so as to provide the claimed contents of La, Mg and Co. Yanagihara et al. set forth a laundry list of elements and various ranges for the subscripts of the formula set forth herein. Yanagihara et al. nowhere recognizes the problem addressed by the present invention, that is, the need to provide favorable discharge properties of alloys with low cobalt content while also providing the favorable particle size properties of alloys having a high cobalt content. Yanagihara et al. do not teach or suggest modifying any of the metal contents to improve any property of the alloys, and certainly do not teach or suggest selecting the specific claimed ranges of La, Mg and Co.

Further, when Yanagihara et al. is properly considered as a whole for all that it fairly teaches, Yanagihara et al. suggest, if anything, using significantly higher cobalt content when magnesium is present in the alloys described therein, not decreasing cobalt content. Thus, at best, Yanagihara et al. actually teach away from the claimed invention.

Applicants respectfully submit that the Examiner errs in concluding that the selected La range is "close enough" to establish a prima facie case of obviousness, without some suggestion in the art supporting the Examiner's proposed modification. The portion of MPEP 2144.05 relied upon by the Examiner references *Titanium Metals Corp. of America v. Banner*, 778 F2d 775, 227 USPQ 773 (Fed.Cir. 1985). The case law cited in MPEP 2144.05 for this proposition, however, does not support the Examiner's conclusion in this application, because the present application differs factually from the cited decision.

In *Titanium Metals*, one of the claims at issue recited a very specific alloy composition that included 0.3 percent molybdenum, 0.8 percent nickel, balance titanium. The prior art included two alloys, one having 0.25 percent molybdenum, 0.75 percent nickel and the other 0.31 percent molybdenum and 0.94 percent nickel. The Court concluded on these facts that Claim 3 was obvious because the claimed invention recited alloy components in amounts that fell in between the ranges shown in the art. *Titanium Metals*, 778 F2d at 783. In contrast, the formula arrived by the Examiner recites an alloy with La in an amount outside that claimed. Further, to even arrive at the formula relied upon by the Examiner in the first place, one must pick and choose from among the range of components and subscripts broadly set forth by Yanagihara et al.

In summary, the Examiner must rely upon an improper hindsight analysis to pick and choose from the broad and various parameters set forth in Yanagihara et al. to arrive at a hypothetical alloy, stated to be "close enough" to the claimed alloys. Yet Yanagihara et al. do not recognize the problems addressed by the present invention, namely, achieving favorable particle size properties of alloys having high cobalt content with the favorable discharge properties of alloys having low cobalt content. Yanagihara et al. certainly do not teach or suggest modifying the alloys disclosed therein for any reason, much less to achieve the properties of the claimed alloys. Thus, Yanagihara et al. do not teach or suggest alloys with La,

Mg and Co percentages as claimed. Indeed, when considered in its entirety for all that it fairly teaches, Yanagihara et al. teach away from the claimed alloys, suggesting, if anything, that alloys with La, Mg and Co include Co in significantly greater amounts than claimed. Accordingly, the Examiner has not established a sustainable prima facie obviousness rejection. For this reason, the rejection of Applicants' claims should be reversed.

(2) When Properly Considered, the Evidence Presented by Applicants Rebuts the Examiner's Determination of Obviousness.

Not only has the Examiner failed to present a prima facie case of obviousness as outlined above. Evidence presented by Applicants during prosecution rebuts any presumption that the Applicants' invention is obvious.

Claims 6 and 7 recite hydrogen absorbing alloys having an a-axis length of 4.990 to 5.050 Å and a c-axis length of 4.030 to 4.070 Å for the lattice constants in the crystalline structure. Claim 17 depends from Claim 7 and accordingly also includes this aspect of the invention. As discussed above, the inventors have found that the alloys of the invention exhibit increased lattice constants, and in particular an increased c-axis constant. This is believed to result in an alloy that is less likely to exhibit particle size reduction, which in turn can increase the cycle life of a battery.

The Examiner acknowledges that Yanagihara et al. do not refer to the length of the a-axis or c-axis. Yanagihara et al. not only do not teach the claimed crystal lattice constants. There is also no suggestion to modify the alloy composition of Yanagihara et al. to provide the claimed lattice structure. Yanagihara et al. nowhere recognize the effect that increasing the lattice constants, and in particular the c-axis constant more than a-axis constant, would have on battery cycle life.

The differences in lattice constants were demonstrated by data provided by Applicants in response to the first Office Action mailed September 28, 2001 (rejecting Claims 1, 2, 4-7, 12 and 16 under 35 USC § 102(b) in view of Yanagihara et al.). To demonstrate the differences in structure of an alloy of Yanagihara et al. and of Claim 6, an alloy having a composition

$LaNi_3Co_{1.7}Mg_{0.3}$ was prepared by the method described in Yanagihara et al. The obtained alloy was ground in a mortar of stainless steel to form a powder and the lattice constants thereof were measured using an x-ray diffraction method. The a-axis and c-axis lengths thereof were 5.045 Å and 3.991 Å, respectively. See Paragraph 2 of the Rule 132 Declaration of Satoshi Shima presented with the Response filed January 28, 2002 in the present application. Thus, the compositions do not have the same crystal lattice constants.

Not only do the compositions not have the same crystal lattice constants. Yanagihara et al. do not suggest modifying the compositions to provide an alloy with the claimed crystal lattice structure. To demonstrate the significance of the lattice constants in the present invention, Applicants also compared the lattice structures of the following alloys. An alloy having a composition $La_{0.8}Ce_{0.14}Pr_{0.04}Nd_{0.04}Mg_{0.05}Ni_{4.36}Co_{0.2}Mn_{0.3}Al_{0.39}$, which contains 2.70 weight percent cobalt and 0.28 weight percent magnesium, were prepared by the method described in the present specification. The alloy and hydrogenated alloy thereof were investigated using x-ray diffraction. The lattice constants and expansion percentages measured are shown as Example 33 in Table 7 of the Rule 132 Declaration of Satoshi Shima. Also shown in Table 7 are results for the alloy having the composition of $LaNi_5$ as Comparative Example 20, $LaNi_5$ being a $CaCu_5$ type crystal structure. The elongations of the a-axis and c-axis are smaller for Example 33 than for $LaNi_5$. In other words, lattice distortion is less for Example 33 than for the comparative example. The lattice distortion causes the particle size reduction as the cycles of the hydrogen absorption and desorption are repeated. Hence, the increase in surface area per unit weight can be suppressed for Example 33 so that the high rate discharge property is improved.

In summary, Applicants have presented data that rebuts a finding of prima facie obviousness. Applicants have demonstrated that the alloys exemplified in Yanagihara et al. including La, Mg and Co do not have the same lattice constants as claimed. Yanagihara et al. do not suggest modifying the alloys to modify lattice constants, much less modifying the alloys to increase lattice constants. Yanagihara et al. certainly do not suggest modifying the alloys to increase the c-axis constant more than the a-axis constant, much less the impact thereof on suppression of particle size reduction. Accordingly, the rejection of Applicants' Claims 6, 7 and 17 must also be reversed based upon the comparative data.

CONCLUSION

Yanagihara et al. fail to teach or suggest hydrogen absorbing alloys as claimed. At best, Yanagihara et al. teach that alloys including La, Mg and Co include Co in significantly greater amounts than claimed. Thus Yanagihara et al. actually teach away from the claimed invention. In addition, Applicants have presented data demonstrating that the lattice properties of the claimed alloys are different from alloys exemplified in Yanagihara et al. The Examiner has failed to make a prima facie case of obviousness. Applicants accordingly respectfully submit that the Board reverse the rejections of record and order immediate allowance of all pending claims in this case.

Respectfully submitted,

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APPENDIX

1. A hydrogen absorbing alloy having a $CaCu_5$ crystal structure in its principal phase, comprising La in an amount of 24 to 33% by weight in the alloy, Mg in an amount of 0.1 to 1.0% by weight in the alloy, and greater than 0% and less than or equal to 6% by weight of Co in the alloy.

5. A hydrogen absorbing alloy according to claim 1, further comprising one or more elements selected from the group consisting of Ti, Zr, and V.

6. A hydrogen absorbing alloy having a $CaCu_5$ crystal structure in its principal phase, comprising Mg and having a-axis length of 4.990 to 5.050 Å and c-axis length of 4.030 to 4.070 Å for the lattice constants in the $CaCu_5$ crystal structure.

7. A hydrogen absorbing alloy according to claim 1 having a-axis length of 4.990 to 5.050 Å and c-axis length of 4.030 to 4.070 Å for the lattice constants in the $CaCu_5$ type crystal structure.

12. A hydrogen absorbing alloy according to claim 1, wherein said alloy is represented by the formula $La_uR_vMg_wNi_xCo_yM_z$, wherein:

R is a rare earth element other than La;

M is at least one element selected from the group consisting of Mn, Al, Si, Sn, Fe, Cu, Ti, Zr, and V; and

the ratio of $(x+y+z)/(u+v)$ is 4 to 7.

16. A nickel-metal hydride rechargeable battery comprising an electrode formed of a hydrogen absorbing alloy having a $CaCu_5$ crystal structure in its principal phase, said alloy comprising La in an amount of 24 to 33% by weight in the alloy, Mg in an amount of 0.1 to 1.0%

by weight in the alloy, and greater than 0% and less than or equal to 6% by weight of Co in the alloy.

17. A hydrogen absorbing alloy according to Claim 6, further comprising greater than 0% and less than or equal to 6% by weight of Co in the alloy.